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How New Will the Bigger University Be?

I: Some Thoughts on the Graduate School*

EDWARD K. GRAHAM

Dean, the Graduate School and the College of Liberal Arts

HOWARD THURMAN tells a story of Professor George Cross of the Colgate-Rochester Divinity School. In his course in Systematic Theology, Professor Cross would not permit a student to discuss the orthodox position, or any other position, until the student could define that position precisely. Professor Cross's idea was that, in matters of faith, one ought to know what one is talking about before one starts talking.

There is a certain relevance here to discussion of the Graduate School of Boston University. The Graduate School is not theological, except in one of its programs, and it has rarely been accused of being systematic in any of them. The Graduate School is, nevertheless, something of a matter of faith. It has few faculty of its own, in the sense of people who operate entirely within the Graduate School and who are paid from Graduate School funds. It has relatively little budget or facilities provided from University resources and specifically ascribed to its general purposes.

To continue the anomaly, the program of the Graduate School is among the most expensive offered by the University, but the expense is hidden for the most part in the College of Liberal Arts, and to a lesser extent, in the other participating divisions. It has a large faculty, most of whom belong to some other division. It is by no means all of graduate education, or even most of graduate education in terms of total degrees awarded. It has an interesting and somewhat uneven series of programs leading to the degrees of Master of Arts and Doctor of Philosophy. It has given to the world a vast number of men and women who have been prepared, through their work at Boston University, to contribute significantly to the arts, the sciences, and the professions.

Of the many enterprises in which the University is engaged, the

*This is the third of a series of articles by Dean Graham. The fourth and final article will appear in an early issue.

Graduate School probably offers more different images to more different people than any other. It is not at all unusual to hear two or more people talking about the Graduate School, using identical language and under the impression that they are talking about the same thing. In effect, they may be discussing totally different subjects. And no wonder. Even the administrative organization is somewhat confusing, particularly to the uninitiated. Within the past year or so, the administrative budget of the Graduate School listed five individuals: a dean who received his salary elsewhere; an assistant dean who received half of his salary elsewhere; and three animal caretakers who were carried in full on the administrative budget, and presumably were the only real administrators. In the Graduate School, nobody raised an eyebrow.

The purpose of this brief is to offer some definition of what the Graduate School is and how it got that way; to relate its original concept to its more recent history and its major current undertakings; and finally, to offer some thoughts on the outlook for the years immediately ahead. The treatment will, I suspect, be descriptive rather than philosophical, since, as Professor Cross pointed out, it is important to know what we are talking about when we get involved in matters of faith.*

Knowing what we are talking about is particularly important during a period when projections on the future of our institutions seem to be concerned primarily with numbers rather than with values. That universities will grow larger is obvious. But there remains a question as to whether we shall have our institutions as we know them, or something else. The question is highly relevant at Boston University. There is an uneasy suspicion that, as someone has said, we may be urging one another to redouble our efforts, while forgetting our aims. It could happen in education generally, and it could happen in the Graduate School in particular.

*Exceptionally sound and provocative philosophical approaches toward specific Graduate School interests may be found in *Graduate Journal* articles by Dr. Frederick Link (Feb. 1958), Dean Walter G. Muelder (Dec. 1958), Dr. Warren O. Ault (Feb. 1959), and Dr. John F. Leisher (Feb. 1959). Also of special relevance to the interests of the Graduate School are Senate Council reports on the role of the arts and sciences, the University's responsibility for research, and the University's responsibility for expanding enrollments. These were distributed to the faculties in mimeograph form during the academic year 1958–59. Ahead of its time was the Graduate School Survey Report of 1951.

Adequately to understand what the Graduate School is, we might first take a look at the way that it came into being.

When the faculty of the College of Liberal Arts met on the afternoon of June 6, 1933, Professor Mather had the floor. The College of Liberal Arts was trying to do something about the Graduate School, and Professor Mather was making a report on behalf of a special committee composed of himself as chairman, and Professors Ault, Brigham, Brightman, and Cameron.

Now somebody has been trying to do something about the Graduate School, off and on, ever since President William Fairfield Warren first proposed "in the post-graduate range, the German idea of indefinitely numerous, super-collegiate aggregations of students." The Graduate School has survived several revisions and efforts to help it. The simple fact of survival, in the face of all these good intentions, is eloquent testimony to the Graduate School's toughness of fibre.

But Professor Mather and his colleagues were professionals, and they knew what they were doing. They had been given their assignment by the faculty, under delegation from President Marsh, who had reviewed the report in advance, suggested certain modifications to bring it into line with the University Bylaws, and had regarded the matter as of such importance that he took over the chair when the amended report was presented.

In its findings, the Committee noted that, during the period 1929–32, the Graduate School had recommended only two-thirds of the graduate degrees awarded by the University; that five divisions of the University were maintaining graduate programs under their own autonomous management; that these divisions had no organic connection with one another or with the Graduate School; that the College of Liberal Arts, while maintaining no graduate division of its own, was the chief support of the Graduate School; and finally, that in the direction of the Graduate School, the College had "inadequate representation resting on tradition and administrative favor instead of constitutional provision."

This, then, is how things stood in 1933. To make them stand differently, and to make constitutional provision, the Committee offered specific recommendations:

1. The chief executive officer should be appointed by the President from the College of Liberal Arts Faculty.

2. There shall be an Executive Board of nine, composed by the chief executive officer and eight other members of professorial rank. Of these eight other members, five shall be appointed yearly by the President, on nomination by the Faculty of the College of Liberal Arts, preferably in March, by written ballot. The three other members shall be selected from the University Senate either by the President himself or in such manner as he may direct.

3. The Executive Board shall determine the general policies and regulations of the Graduate School, subject to approval by the Graduate Faculty, and the approval of the President of the University. The Board's powers shall not extend beyond the limits fixed by the Graduate Faculty, and the Board shall report to the Faculty as requested.

4. Except as excused by the President, on recommendation by the Dean of the College of Liberal Arts all professors, associate professors, and assistant professors of the College of Liberal Arts shall be members of the Faculty of the Graduate School.

5. Additional members, from the professors, associate professors, and assistant professors of other departments, may be appointed by the President, provided that a substantial majority of the Faculty of the Graduate School shall always be from the College of Liberal Arts Faculty.

6. In addition, instructors may be appointed by the President for exclusive service in the Graduate School, as members are now added to the several faculties of the University.

7. For the name "Governing Faculty," substitute "the Faculty of the Graduate School."

8. So far as practicable, chairmen of Graduate School departments of instruction shall be members of the College of Liberal Arts Faculty.

The report was adopted. The administration approved it. President Marsh called for ballot on the five members of the Graduate Board to be nominated by the faculty. Dean William Marshall Warren, and Professors Ault, Brightman, Mather, and Newell were nominated by the faculty and confirmed by the President. The re-organized Graduate School was under way.

It took a little time to get the new structure fully operative. During the first year, the redoubtable Professor Brightman assumed the Chairmanship of the Graduate Board, and Professor Lesourde, of what was then the School of Religious Education and Social Service, served as Secretary of the Board. There was no dean, so far as the record shows, following the retirement of Dr. Weysse in 1933. In 1934,

Professor Lesourde was given the title of Dean, and served as Secretary of the Board and Dean, until he resigned in 1945—two years later to become Dean of the School of Public Relations and Communications. Professor Brightman retained the Chairmanship of the Board until his retirement in 1951. Since that time, the deans of the Graduate School, all of whom were appointed from the faculty of the College of Liberal Arts, have chaired the Graduate Board. (The subsequent careers of the three former deans suggest an intriguing variety, comparable to the variety of the Graduate School itself—one is a founder of a dramatically successful electronics corporation; one is a university president; and one is executive assistant to Dr. Norman Vincent Peale.)

The constitutional provision of the Graduate School could be changed, and with it the structure of the Graduate School—just as anything could be changed. Presumably it would not be changed until a professional decision has been made that it is no longer useful in its time, in accordance with the deliberative procedures which attend change in a constitutional provision. The live hand of the past is a powerful factor in all education—even more powerful than the dead hand.

The constitutional provision is significant in a number of ways. In the first place, it is the governing document which has controlled the Graduate School for the past twenty-six years. Its provisions are still binding. Another interesting aspect of the document relates to the academic components of the Graduate School. What was established was not a graduate school which would embrace all phases of graduate education. What was established was a graduate school of arts and sciences. This is what exists today. Included at the outset were programs offered by departments of the College of Liberal Arts and leading to the degrees of Master of Arts and Doctor of Philosophy, and, through the participation of cognate professional faculties, programs leading to the degree of Master of Arts in Education and in Religious Education, and to the Master of Arts and the Doctor of Philosophy in Medical Sciences. Within two years, graduate programs in the arts and sciences under the immediate responsibility of the faculty of the School of Theology were added through a Division of Theological Studies. By 1945 programs in Music, leading to the degree of Master of Arts and Doctor of Philosophy, were initiated. All of these graduate

programs conceived as falling within the arts and sciences but under the immediate responsibility of faculty drawn from the professional schools, were in addition to the graduate professional programs administered directly by the professional schools involved. It was planned that way.

The point here is not whether graduate programs in the arts and sciences are better or worse than graduate professional programs. The point is that there is a difference which one look at graduate professional curricula, as contrasted to graduate arts and sciences curricula, makes obvious. The constitutional provision under which the Graduate School is governed addresses itself to assuring that the difference is recognized from the standpoint of organization and administration, and in the interest of academic integrity.

This brings us to a point where a definition of the Graduate School begins to emerge. Basically the Graduate School is a faculty, drawn from the several divisions of the University organically related to the arts and sciences. It sustains a filial relationship to the College of Liberal Arts, which gave it birth. It is also a rather disjointed student body, consisting of some 235 full-time and 425 part-time students, every one of them hopeful of getting a degree some day.

The primary function of the Graduate School (what it does, as opposed to what it is) rests in the education of these students for better or worse, for like any school or college, the Graduate School is first of all an educational institution. All of its other functions are secondary, or derived, no matter how important these other functions may be. The Graduate School has a vital stake in research, a moral obligation to take the lead in fostering and promoting research, and to do all that it can to protect the research man in a climate that leaves something to be desired from the standpoint of conditions for research work. The research spirit is its life blood. But the Graduate School cannot properly be described as first of all a research institution. Research, like all creative endeavor, is an individual more than an organizational operation. Through the essential quality of a graduate faculty and through the compelling significance of research in the education of graduate students, the Graduate School serves as the connective tissue which gives substance and focus to the idea of research as a pivotal function within any university worthy of the name.

The fact that the instrument of government of the Graduate School

has remained stable for twenty-six years does not mean that the Graduate School has stood still. Nor does it mean that the distribution or pattern of graduate education throughout the University has remained unchanged. There has been what amounts to an explosion in graduate professional education; that is, in graduate education conducted by the professional schools outside of those divisions whose first degree is a graduate degree. The number of graduate professional degrees has increased fourfold. For example, the University created as many Masters of Education at its August Commencement this year as the total of all graduate professional degrees for the entire three-year period 1929–32. The number of M.A.'s and PH.D.'s awarded during the period 1956–59 was only half again as large as the number for the period 1929–32. Where the M.A. and the PH.D. formerly constituted two-thirds of all graduate degrees awarded, they now constitute less than a fourth, or 680 out of a total of 2810 during the period 1956–59. The trend in the University is clearly toward a dramatic increase in graduate professional education. Within the Graduate School proper, the recent trend has been toward a decline in M.A. degrees, and a marked increase in PH.D. degrees.

Our concern here, however, is not with changing patterns of distribution in graduate education generally, except as they illustrate the relative position of the Graduate School, from a quantitative standpoint, in the graduate education picture. Our concern is with the Graduate School and changes within its own program.

The formidable program which has been carried forward since the end of the Second World War has rested largely on the vision and progressiveness shown by the faculties under the leadership of two remarkable deans: Chester A. Alter and Duncan E. Macdonald. It was under their leadership that concern for standards and for the development of professional excellence took on new life. Successful new programs, based on old values and solidly rooted in the subject-matter fields, include the Physical Research Laboratory (of more or less blessed memory), Clinical Psychology, the African Research and Studies Program, and the program in International Relations established at the Naval War College. Co-operative arrangements in teaching and research were initiated with the Worcester Foundation for Experimental Biology. These and other examples of the forward movement in the Graduate School are significant in and of themselves,

but even more important, they reflect the revitalized spirit in the Graduate School.

Since a graduate school travels on its minds in much the same way that an army travels on its stomach, the loss of Dean Alter and Dean Macdonald was a grave one. Each of them had left not only an indelible imprint but also a testament of aims and objectives. During the past two years, when the Graduate School and the College of Liberal Arts have been jointly administered under a policy first advocated by Dean Alter, the Graduate Board set up as a major objective the developing of the resources of the Graduate Board and the Graduate faculty, and bringing these to bear most effectively in major areas of Graduate School responsibility as conceived by preceding deans.

On the principle that an academic organization is effective virtually in direct proportion to the extent to which all members of the organization are fully informed and are given opportunity to participate within the framework of their professional responsibilities and competence, the first move was to clarify the role and the obligations of the Graduate Board. The Board had acted in a dual capacity as executive agency of the Graduate faculty and also as an advisory council to the Dean. Over the years, its work had become so diffuse that, at a single meeting, it might debate the qualifications of a second reader on a thesis, and also such an important policy issue as professional affiliation with an independent research laboratory.

As a result of its deliberations on organization and function, the Board identified four areas of major responsibility and set up four committees to serve the Graduate Board in each area. These included a Committee on Academic Policy, under the chairmanship of Professor Schilling; a Committee on the Preparation of College Teachers, under the chairmanship of Professor Millard; a Committee on Research Policies and Procedures, originally under the chairmanship of Professor Loew and now under the chairmanship of Professor Sinex; and a Committee on Admissions and Degree Requirements, under the chairmanship of Professor Fletcher.

These committees, reporting to the Graduate Board for each of the four areas with which they are associated, provide opportunity for a much sounder professional study of major problems and policies than the Board had been able to accomplish hitherto. They also make it possible to take advantage of the broad range of professional skills and

undertakings within the Graduate faculty over and beyond the membership of the Graduate Board.

Another matter to which the Graduate Board has recently given its attention is that of the faculty of the Graduate School. Strengthening the faculty is obviously synonymous with strengthening the Graduate School, and yet there were no stated criteria for membership, but only the conditions for appointment which had appeared in the 1933 report. While every member of the faculty of the College of Liberal Arts above the rank of instructor might be a member of the Graduate faculty on the recommendation of the dean, "unless excused by the President," there were no specific standards on which a dean might base his recommendation or the President might base his excuses. Accordingly, the Committee on Academic Policy developed criteria for membership which should govern all future appointments, and which might be used by all deans in all divisions in making their recommendations to the Board, and by the Board in making nominations to the President. These were presented to the faculty and approved. The salient provisions of the criteria address themselves toward assuring that members of the Graduate faculty were qualified for, and actively participating in, programs of teaching and research associated with the Graduate School.

Another issue of vital concern related to the qualifications of students admitted to the Graduate School. Here the problem seemed to have many faces. In both M.A. and PH.D. programs, distribution was not only uneven from the standpoint of numbers in the various departments, but also from the standpoint of abilities of the students involved. In certain areas, the Graduate School seemed to attract a large number of applicants of superior qualifications. In other areas, numbers might be large, but problem cases proportionately large. In still others, numbers were small and quality high. And finally, there were cases where both number and quality left much to be desired.

Study by the Committee on Admissions and Degree Requirements, which was asked to evaluate the situation and make appropriate recommendations, revealed also that there was no factor discernible in the admissions process which would provide for evaluation of students in different fields, or coming from different institutions, on anything resembling a comparative basis. We had too many failures, and what is worse, too many mediocrities. There was no base line which the

Committee regarded as adequate for judging the cases which it reviewed. We were getting the answers too late, and the answers were not good.

While departmental recommendations, as in the past, would continue to be the primary factor in accepting or declining applications for admission, it was the conclusion of the Committee that it could not carry forward effectively its work of evaluating individual applications and departmental recommendations unless there were also available a test score on which the student might be judged from the standpoint of a national norm. All candidates for admission to the Graduate School are now required to take either the Graduate Record Examination or the Miller Analogies Test, as a prerequisite for final action by the Graduate School. Now obviously nobody has the whole answer on how to get superior students. There are many variables apparently operative in the quest. Adequate support in the form of fellowships and scholarships would be of tremendous help. So would better library and laboratory resources. But money, and the things money can buy, are evidently not the whole answer. Conceivably factors so difficult (or delicate) to evaluate as relative faculty status and reputation in the several fields may have an important bearing on why some departments attract quality. The entire question of why superior students choose a particular institution, or a particular field within an institution, requires objective analysis.

This points up the question of standards generally, and the dilemma facing graduate schools in an era when the pressures for enrollment are exceeded only by the national anxiety as to how increased numbers are going to be handled. Admittedly numbers is a problem. I suspect that even more of a problem is the preoccupation with numbers by commissions, committees, and educational leaders who have made solemn pronouncements on ways to meet the problem, in what conceivably may be the uncritical presupposition that they know, in all respects, what the problem really is in the first place. This has contributed to our predilection for pronouncements on how big our institutions should become rather than how good they can become at the same time. We know how things stood in 1933, but how do they stand in 1959? And who is minding the store?

There is something inexorable about this whole business of numbers. How many students can we handle? Will there be three million

or six million students in college in 1970? What are we going to do about the utilization of resources? What about federal aid to education? Where did that loyalty oath come from? Where are we going to get the faculties? Questions of this sort as well as those relating to such tangibles as dormitories, dining halls, financial resources, teaching and administrative staff, organizations, devices for teaching more people in less time, and all the rest are important. They relate to the here-and-now. They are vital to such prerequisites as feeding so many warm bodies, getting them bedded down, seeing that there are enough teachers to go around, and so on.

But *things* are only part of the picture. As the late Alan Gregg has reminded us, when we are talking about colleges and universities we ought not to ask ourselves "What is the set-up?" We ought to ask "What is the story?" Even more than by things the story will be told by certain compelling intangibles. These compelling intangibles will have a lot to do with shaping the course of colleges and universities. They may even help provide the answer to the question asked at the outset: How new will the bigger university be? They will have a very direct bearing upon any thoughts that may be developed on graduate education, and on the Graduate School particularly, during the years ahead.

With respect to the Graduate School, it is my conviction that any projections of an early increase in the size of the student body are unwarranted, and that to undertake such an increase as a deliberate objective would be unprofessional and a disservice to society.

A first compelling intangible on which this conviction is based relates to fifteen years of effort on the part of the Graduate faculty to develop excellence in the graduate programs which are entrusted to it. The Graduate School has a moral obligation to raise standards not as some sort of abstract operation regarded as academically respectable, but rather because it has a commitment to educate the finest type of professional which our faculties and our resources permit.

This means two things. First of all, the Graduate School will not initiate new programs, or admit students to existing programs, beyond the limitations within which excellence is possible. There remains much to be done in bringing the quality of students whom we can attract into line with our potential for producing the quality of teaching and research which the twentieth century demands. The

American educational scene is marred by blighted areas where the seductiveness of numbers has distracted attention from the fundamental of quality. The encouragement of mediocrity is no service in any century.

The problem of getting good men and women, not only of sufficient numbers but also of superior quality, is always with us. Distilled to its essence, a graduate school is no more than its faculty and its students, the ancient guild of masters and scholars. This is another of the compelling intangibles. We may make a substantial contribution in the direction of meeting the problem by implementing the excellent report on the preparation of college teachers, prepared last year by the Committee chaired by Professor Millard—a project which doubtless helped stimulate a formal project which will be initiated by the Department of Biology next year, and which has provoked renewed interest in programs which several departments have maintained over the years.

On the whole, the Graduate School of Boston University depends a great deal for its strength upon the excellent group of younger faculty, or what might now be called younger faculty emeriti, who came to the University early in their careers and who have made significant contributions both in teaching and in research. One of the University's virtues is that its infinite variety has minimized the effects of inbreeding. Nevertheless, it would appear that a marked increase in initial appointments at senior faculty rank is clearly indicated in the interest of the Graduate School. I hasten to point out that this does not involve a freezing of present ranks. Virtually any appointment at the rank of full professor would, in the College of Liberal Arts, be a substantial increase. The established practice has been to replace senior faculty, on death or retirement, with an appointment at a much lower rank.

With the exception of an occasional departmental chairman, there has been no initial appointment at the rank of full professor in the College of Liberal Arts (which must always provide a substantial majority of the faculty of the Graduate School) during the past fifteen years. I doubt that we can hold to that record, and I am confident that it would not be a good thing if we could.

Then there is this chronic issue of the library, confronting all the divisions of the University where books and ideas are important. Library resources have special relevance to the Graduate School. It has been noted that a Graduate School can be no better than its faculty.

A University can be no better than its library. Our library is strong in some respects, but not in others. Its deficiencies are a major factor in the reluctant decision of certain strong departments not to encourage expansion of their programs. It is obviously a factor in the difficulties which are encountered in attracting superior graduate students in certain specializations where the availability of good library resources is a primary factor in the choice of an institution. Along with an adequate library must come, of course, a good library building, both to house the library and to provide the order of service which faculties and students alike expect from a university, and which they expect to be a matter of first concern. The recent announcement of an appropriation to draw up plans for a library building is encouraging.

The conflict between the demands of teaching and research is a not unhealthy phenomenon at virtually all universities, although its ramifications are particularly perplexing in those institutions which have no substantial endowment or adequate appropriations for research, and which must depend mainly upon tuition. This brings us squarely up against a complex of questions. To a research man (and that means anyone who has an idea which he wants to pursue, and which he believes might enable him to find out something that nobody has ever found out before), the source of funds in support of unsponsored research is not of primary concern. He simply wants to know that the money is there. In this connection, one can think of four or five reports on research which have been prepared during the past few years. Virtually every one of them quite properly takes the position that the University ought to put more money into research. Occasionally, this is associated with the idea that overhead from research contracts might be assigned to unsponsored research. But the major question of where the money comes from has not been faced, let alone answered. If it is generally accepted that money paid by students for tuition and other services should be primarily devoted to those services which students receive, and the major source of university income is tuition, then obviously monies received from tuition and student fees should be in some way related to direct or indirect services for which the students are, in effect, paying.

Now obviously students in the arts and sciences, who constitute virtually a third of the University's total enrollment, receive both a direct and an indirect benefit from being part of an operation where

the quality of mind that can carry forward research is involved in the undergraduate as well as the graduate teaching programs. In certain departments, research programs are used directly in the undergraduate programs for illustration of principles, for involvement of students in advanced laboratory work, and in a number of other productive ways. The fact remains that there must be a reasonable extent to which general income in a tuition-supported university can justifiably be applied toward research—or to other purposes which are even less directly related to student services. The question of dollar-use is of acute faculty interest at all institutions. The faculty do not want to know what the financial power structure is. They know that. What they want to know is how it works. Effective communication on policies and procedures which govern allocation of resources, and on the value judgments involved, is of the essence for a good academic climate.

Similarly unresolved is the question of whether there is any obligation, real or implied, to assign part of the overhead on sponsored research to general research purposes. The theory of overhead, as it is generally understood, does not provide the University with a profit, and contracting agencies devote a great deal of attention to writing contracts so that overhead does not provide a profit, but simply reimburses the University for unitemized expense. A great part of unitemized expense, one would suspect, are those invisible items which relate to the time, energy, and effort which the operation of sponsored research programs imposes upon an institution. Here again, it would appear that an objective look at real costs, and an attempt to approximate invisible costs, with full communication of the results, might bring light and air into a situation which has occasionally been characterized by heat.

We may have wandered from the basic question of the conflict of teaching and research into one of its many facets. The necessity for excellence in both, and for development of the full potential of both, need not be labored. What does need further exploration is some evaluation of research itself. Research in a tuition-supported institution has to fight such a hard battle that we may be inclined to accept the idea that all research is good, in the sense of being relevant to the University interest. This is open to question. My impression is that in talking about research we are inclined to get somewhat solemn and self-conscious, as when we talk about motherhood or democracy, and

to fall into generalizations characterized by rotundity of phrase, fine writing, and flowery thinking. Let me offer a simple example of what I mean. It would be generally accepted throughout the University, as it is throughout the scientific world, that our research in microcirculation is distinguished, that it has made significant contribution to man's knowledge of things that had not been found out before, and that it has been a credit to the University and to Dr. Lutz, Dr. Fulton, and their colleagues. This judgment is based on the soundest criterion that we have in the academic world—the best professional judgment, or the considered opinions of people who know the field and whose evaluations have come to be regarded as sound and acceptable to the rest of us. There are a number of other research operations throughout the University which similarly are known and accepted as good, because the best professional judgment has clearly marked them that way.

But what about the wide range of other projects about which less is known? What proportion of them would fall under the heading of basic research? Of those which are not basic, but developmental, are there any which may not be entirely relevant to the purposes of a university? Now obviously we support research for its own sake, and in default of a critical judgment, we have to support it uncritically. If this were not so, nobody would ever find out anything.

There are, however, criteria that are generally known, or can generally be applied, to determine whether or not certain types of operations deserve respect and support from the community of scholars. I should like to offer, hypothetically, the idea that uncritical veneration of research and uncritical pressure for publication on the part of colleges and universities have been responsible for cluttering the pages of our learned journals with more irrelevant and inconsequential verbiage than any other single factor. By way of illustration, let me cite an article —not by one of our faculty—which I recently ran across, and on which someone presumably had spent endless hours. This gem of creativity was directed toward identifying higher levels of meaning in *Huckleberry Finn*, with special reference to the feud between the Grangerfords and the Shepardsons. As I remember it, the thesis was to the effect that Huck's friend, Buck Grangerford, was a Christ symbol, and that his death in a shooting scrape had something to do with the Crucifixion. I had always labored under the impression that Mark

Twain was simply writing one of his most moving passages of human tragedy, and incidentally, that one of the Shepardsons was a pretty good shot. Hannibal is a long haul from Montparnasse.

It is entirely accidental that, of the two examples of creative work just related, the one which obviously relates to excellence happens to fall in the sciences, and the one which illustrates the futility of the academic mind in its more misguided moments happens to fall in the humanities. As a matter of fact, the quality of creative work in the humanities and the social sciences would compare favorably with that which goes on in the natural sciences. It is perhaps in order, as the faculties are the first to recognize, to point out that there are points of strength and points of weakness in virtually all fields. The important thing is that some good things are happening in some places, and that in the humanities and the social sciences the good things that are happening fail to get adequate recognition.

This is understandable. It relates in part to a national phenomenon of confusing research with science, and to a tendency on the part of some scientists to confuse grants with research—at least in their terminology. While a little research had gone on for a long time at Boston University, the big boost toward creative effort came right after the last war, and the most dramatic boost of all was sponsored research. Somehow, the words "grant," "contract," and "project" have become almost synonymous with the word "research." It is not uncommon to hear scientists—excellent fellows in the main, and wholeheartedly dedicated to the interests of the University—refer to "my grant" or "my contract," when what the scientist really means is "my research," or "this problem on which I am working and about which I hope to find out something that nobody has ever found out before." Somehow the idea of status inadvertently may have become associated with having a grant, rather than with creative work in and of itself. This phenomenon is strangely reminiscent of some lines of Emily Dickinson, where she is talking about another status symbol:

"My Husband"
Women say
Stroking the melody,
Is this the way?

It is symptomatic of our confusion of money and research that I have been able to write at this length without adverting to the type of

research which does not take money. The contagious habit of joining money and research overlooks what is probably the major context in which research is carried forward. It overlooks research which requires only free time and encouragement as the primary contribution of the University. Somebody will do the university world a real service some day by writing an uninhibited book on the economic interpretation of academic values.

Time and encouragement are basics not only for the humanists and most of the social scientists, but also for many of the natural scientists. Hans Bethe was able to publish his exciting theory on the energetics of the carbon cycle as a source of solar energy not because somebody put a substantial sum of money at his disposal, but because Cornell University thought it was important to have a theoretical physicist around, and to give him time to sit in peace with his pencils and stacks of yellow paper.

Time to do research is, in its way, an indirect subsidy. Possibly the emphasis on heavy teaching loads may occasionally be overstated. But the nemesis of the research spirit, and the nemesis of creativity in any form, is that peculiar quality of mental staleness that sets in when academic man is required to take on too many repetitive assignments. Essential to creativity is the occupational therapy of having a reasonable amount of time of one's own. That institution which does not provide such time—possibly on the theory that teaching is a challenge sufficient unto itself and a revitalizing experience—winds up by losing its creative genius in research. The irony of it all is that it winds up by losing its creative genius in its teaching as well.

From a general view of where we have been and where we currently stand in the Graduate School, we might move now toward the hazardous business of predicting where we are heading during the next decade. Here are some of the developments—admittedly speculative in some instances, virtually assured in others—which are on the horizon.

During the immediate future, the Graduate School will get better before it gets bigger. By the will of its faculties, it probably will not expand at all until it has developed the strength and resources necessary to assure excellence in the programs which it offers. A major concern will be the development of areas in which work can be productively carried forward, and an abandonment of areas where concentrations are not indicated. In accordance with the resolution proposed by the

Committee on Admissions and Degree Requirements, and unanimously approved by the Graduate Board, evaluation of current and proposed programs will be formally established and thoughtfully carried forward by the faculties, in order to develop the sort of professional judgment which is a prerequisite to academic soundness.

Graduate and undergraduate education in the arts and sciences will increasingly recognize their community of interests and their interdependence. There will be a continued strengthening of planning and programs in the College of Liberal Arts and the Graduate School, and concomitantly, a continued strengthening of co-operative programs established by these divisions in co-ordination with the professional schools.

Increased emphasis will be placed on the role of the Graduate School in the preparation of college teachers, in implementation of the Millard report. Of special concern will be the relatively small fractions of doctoral candidates in certain fields who enter college teaching after receiving their degrees. While no firm conclusions may be justified, even in the light of the rather extensive data obtained in preliminary studies, it would appear that the University may be subsidizing a training ground for industry in some programs where there should be an aggressive effort to obtain industrial subsidy. Even more important, there will be further development in co-ordination of programs for preparation of college teachers currently operated by several departments, and encouragement and assistance in the launching of new programs as these inevitably will be developed.

There will be increased University interest and support of research, and a concentrated effort throughout the University structure in encouraging and recognizing creative work in the humanities and the social sciences particularly. The research budget cut will be restored.

Increased interest in research will promote a somewhat more objective and tough-minded attitude. This will be reflected not only in formal evaluation, but also in new devices to encourage creativity. Among the devices will be specific provision for a reduction in teaching and committee assignments for faculty members who present, in advance, projects or ideas in support of "grants" of released time, or partial "sabbaticals-in-residence." There will also be a fixed number of fellowships for summer study, awarded through a University-wide competition, to relieve successful candidates of the financial necessity

of summer employment, in order that they may carry forward intensively the research and writing projects which they will offer in support of their applications for summer fellowship assistance.

The projected library building, with concomitant enrichment of library resources, will provide a boost for research in all fields comparable to the boost that sponsored research gave to the sciences in the immediate postwar period.

In graduate education as a whole, the graduate professional programs will increase both quantitatively and qualitatively as professional education continues the present trend toward extending professional education on advanced levels. From time to time, there will be proposals to bring all graduate education under a single academic tent. Committees will be appointed. Reports will be made. There will be much discussion.

Ultimately and inevitably, the University will establish a graduate center, designed to provide the facilities, atmosphere, and conditions for living and working that will make the University a more attractive place from the standpoint of the graduate student, and will go a long way toward upgrading the intellectual climate.

Virtually all M.A. and PH.D. programs will follow the trail blazed by the doctoral program in Physics, and will be offered during the evening hours as well as during the daytime, under the direct supervision of the Graduate School—this in recognition of the fact that increasing numbers of excellently qualified young men and women, who would like to carry forward graduate studies at night, are in the Boston area and are not currently served by any first-rate graduate school.

There will be an inevitable increase of interdepartmental course offerings, and conceivably—though not necessarily—new concentrations leading to advanced degrees. There will be nothing new about this. It has gone on since the psychologists escaped from the philosophers some seventy years ago. The process is likely to be accelerated in an era of rapid social change, when the basic disciplines are developing new specializations to serve new needs, and when increase of knowledge is fusing together the professional concerns of departments that formerly had little to do with one another.

Predictions might continue indefinitely, with the happy assurance that they would not involve us in so wild a dream as some of the prophets of the brave new academic world have offered us in solemn

reports and in platform pronouncements at conference after endless conference. There is the even happier assurance that nobody would remember our predictions or call us to account for them. But there is a basis of experience in the recent history of the Graduate School that gives good, solid ground for what amounts to a conclusion about the future, rather than a prediction: The sense of values in the Graduate School will not change, and in this most important respect, the Graduate School in the bigger University will not be new at all. The voice of the scholar will be heard in the land, to the confusion of the dedicated apostles of mediocrity who crop up from time to time like crabgrass in the Grove of Academe—and, as it is written in the Book of Daniel, "many shall run to and fro, and knowledge shall be increased." So, conceivably, shall imagination and vision.

University Support for Research in Science

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IN the following we will limit our discussion to scientific research as a particular form of scholarly activity. Scholarly activity, in any of its forms, consists of the development of new knowledge and the development of new individuals who become the recipients of current knowledge and participate in the further extension of knowledge. We intend our remarks to apply to research in the humanities, to bibliographic research, to criticism, and to other forms of scholarly activity, despite our exclusive use of language and problems particularly germane to research in science.

Our aim here is not to justify scientific research nor to defend the university as the primary locus of these activities. Research as a vital function of the university we take as given and proceed to consider the various forms of support which may be provided and how the pre-

sence or absence of a particular form may affect the research effort.

Indirect forms of support depend heavily on the research climate of the university. By a good research climate we mean a set of attitudes within the university which esteem research activity, which value it intellectually, which reward those who participate in it, and which lead to active fostering of research by all means available to the university. Such attitudes are vital within the faculties and are crucial within the administration where there must reside not only policies which support research, but also an active program of support for on-going studies and for the stimulation of new activities.

The presence of such attitudes leads to academic freedom, an intangible support of research which can be provided only by the university itself. While academic freedom may and does exist in some non-academic research centers, it cannot be provided for a university by outside sources. Its presence fosters diversity of problems by permitting full scope to the interests, skills, and ingenuity of individuals in different areas and with widely divergent views. Its absence may result in the rejection of new ideas or the failure to develop them, the inbreeding of researchers and routine repetition of research exercises.

Another indirect support of research which may be provided by the university and only by the university is freedom from non-academic duties. Research cannot be a casual undertaking. While it need not be a full-time activity, it must be a scheduled activity. Some experiments cannot be carried out except by sequential commitment of time for regular operations. Others may not require a fixed schedule, but nonetheless require a definite investment of time. Apart from the time spent in the company of the experimental material, a good proportion of the researcher's time must be spent in study and thought. If he is supported by freedom from irrelevant activities, sound experimentation may result. In the absence of this support, thinking is the most vulnerable of his activities. Scheduled times for experiments may be honored; the cost of subjects or preparations lost because the experiment was not carried out at the appropriate moment is readily demonstrable and provides acceptable grounds for avoiding other functions. Thought, however, is difficult to assess on a cost basis; it is time consuming but not necessarily time-bound; and it can always be put off until tomorrow. The consequence is likely to be that the quality of research suffers since the researcher, wishing to accomplish something

and able to free time for experimentation, carries out studies which are not always thought through.

The forms of support discussed thus far have been indirect, do not require budgetary action, and can be provided only by the university itself. Another form differs only in that it represents a direct commitment by the university to an individual faculty member. This is the support provided by tenure; such support makes possible continuity of research. While scientific discoveries often appear to be happy accidents, these accidents usually occur only because the conditions necessary for their occurrence have been set down as the result of long and painstaking labor. Fleming's discovery of penicillin is a case in point. Lack of this support discourages the planning of long-term research goals and programs, often resulting in discontinuous or even haphazard studies. The effect of tenure on individual security may also improve the quality of work.

Closely allied to support via tenure is, of course, the matter of salary. This leads us to forms of support which are direct, require the expenditure of funds, often in substantial amounts, and may be implemented internally by university contribution or externally by funded grants or contracts. The researcher may be supported by a full-time research appointment, by a full-time faculty appointment with research understood to be a definite part of his load, by an arrangement whereby his salary is partly underwritten by the university and partly funded from outside sources, or by complete outside funding. The establishment of research professorships provides nuclei within the university which lead to the provision of research facilities and intangible supports for other workers. Full university support of faculty members with duties divided between teaching and research can allow full benefits of the indirect supports discussed above. Part internal and part external support of salaries or completely external support have the disadvantage of usually requiring the researcher to engage in fund raising activities in addition to scholarly ones. This issue will be discussed more fully below when we deal with the question of control of research.

While we have excluded discussion of classroom teaching as a part of scholarly activity, we cannot avoid the teaching role of research activity as such. A recent conference on this subject resulted in the conclusion that the training of a researcher can effectively be accom-

plished only by the apprenticeship method.[1] Direct support through research fellowships, at least one per faculty member clearly committed to research, may be provided either by the university or by external funds.

Direct support may be in the form of the hardware of research; since much research entails the development of new instrumentation, support is necessary in the form of shop facilities for the construction of mechanical, electronic, and glassware devices.

Numerous administrative functions are necessary to support the research effort within the university. Laboratory and office space must be provided; secretarial and technical aid is necessary. The cost of publication in scientific journals is no longer minimal and should not be borne by the individual. Provisions for local publication by the university press are also necessary. These supports are necessarily internal, although space may be provided by external agencies, usually on a matching basis. For example, laboratory facilities for research in the area of mental health may currently be underwritten by federal funds up to fifty per cent.

A *sine qua non* in the armamentarium of a productive research organization is the fund of extant knowledge represented by the library. The multiplicity of use of library facilities in the university setting and the consequent feasibility of adequate libraries is perhaps a major reason for the tradition of the university as the locus of scientific research.

A relatively new area in which support for research is necessary is that of machine computation. Since the Fisherian revolution in experimental design, problems requiring multivariate solutions have been susceptible to analysis. The methods of solution have long been available, but the brute amount of computation necessary has restricted such efforts until the advent of electronic computers. With the machines currently available the main bottleneck in scientific research has shifted from the analysis of data to the collection of data. The result sometimes is that data to be fed to the machines are not available soon enough to maximize use of machine time, thus increasing the cost of already expensive operations. When the cost of idle machinery is set against the cost of the researcher's productive intellectual power, however, a vast saving may be noted. For example, one of us completed

[1]D. W. Taylor *et al.*, "Education for Research in Psychology," *American Psychologist*, XIV, No. 4 (April 1959), 167–179.

a machine solution to a research problem in an hour of technician's time and five minutes of machine time. Otherwise the experimenter would have spent over forty hours of routine activity. While the cost of computers is less to universities than to other organizations, some part of the cost must still represent direct university support of scientific research.

A final form of support which the university provides for scientific research is simply its organizational structure as a basis for grants from external sources. It provides the responsible fiscal authority and the housekeeping facilities which the individual researcher cannot provide.

Increasingly, support for scientific research is becoming available from federal and foundation sources both in the form of grants-in-aid of research and contracts for specific research problems. These forms of support for research increase tremendously the ability of any university to broaden the scope of research activity. For example, current research in the science departments of Boston University which is supported by external funds represents the equivalent of an endowment on the order of $10,000,000, the interest from which is applied to scientific research.[2] This trend will undoubtedly continue, and there are indications that unrestricted funds for research may become available to universities from federal sources, thus making explicit federal support for faculty research positions.

While this form of support provides a great boon to any university, and particularly to the unendowed university, there is need for examination of its effect on scholarly activity. Its advantages are obvious; its disadvantages bear scrutiny. Consider first the fact that outside sources of funds exert widely varying degrees of control over the researcher and the research which is carried out. Some organizations grant in such a way that the investigator may change the research plan which formed the basis of the grant at any time that he perceives a new and seemingly more fruitful course of action. At the other extreme, the investigator may be bound by a particular problem and a specified mode of approach.

Control by specification of problems and methods, by justification, by review, and by pressure for publication does not arise if research is supported directly by the university by the investment of funds in re-

[2]We are indebted to the chairmen of the science departments and particularly to Professor J. Philip Mason for these data.

search activity and indirectly by the provision of a sound research atmosphere. Such controls can and do exist where support is provided by external sources.

Failure of the university to provide the types of direct support indicated above may have two effects on the quality and quantity of research produced and upon the persons conducting research. First, it may result in the kinds of control which stifle imaginative and original work. Second, it may operate to vitiate the efforts of the indirect types of support that we have discussed previously. If the researcher must justify his problem and cannot obtain funds for it without justification, he tends to choose problems not on their scientific merit or on their consuming interest for him, but rather on their popularity, prestige, or fashionable value.

When, as is often the case, the awarding of a new grant depends upon the outcome of a study previously supported the researcher is subjected to the direct or subtle demand to produce positive results despite the fact that negative results may be of scientific importance.

An especially insidious result of the abrogation of university responsibility for supporting research in the face of lucrative external sources of support is the effect on the researcher directly and upon his work as a result. Where outside support is used to supplement university salaries, the researcher is almost forced into the role of research entrepreneur. His energies become devoted to grant-getting rather than to the solution of scientific problems. Even if his salary is not directly dependent on outside funds, there appears to be arising an attitude that grant-getting is to be valued in the academic community and that this activity may serve as a substitute for classical scholarly activities and provide a basis for promotion or increases in salary.

To the extent that such activities detract from energies applied to research per se, the effort must be classified under some rubric other than scientific research or scholarly effort. To the extent that we wish to maintain the scholarly tradition of the university we must provide the indirect supports of research which only the university can provide. We would not propose the abolishment of external supports, but we would argue strongly that such supports cannot replace but can only augment internal fiscal support. Only with a nucleus of internal direct and indirect supports can research advance as a scientific enterprise without diversion of the researcher's effort.

The Relation of Science to the Humanities and Social Sciences

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IF there is anything less appropriate than a scientist writing about the relation of science to the humanities, it is a humanist writing about it. In general this is true because of the structure of the curriculum of most liberal arts colleges, which assures a more extensive exposure to the humanities for the science major than to science for the humanities major. Moreover, if there is a more effective way for one in the sciences to raise the hackles on the humanist than by writing about the relation of the sciences to the humanities, it is to propose that the scientist is, by virtue of his training, more competent to do so.

Thus with the humanists bristling and the scientists smirking, we shall consider what one avenue of intellectual endeavor has to do with another. But first, of course, in order to be consistent with scientific procedural principle, we must distinguish as clearly as possible between the nature of science, the nature of the humanities, and the nature of the social sciences, or, to express it in a more commonplace way, we must define our terms. Alfred North Whitehead defines science as cumulative, positive knowledge. We ordinarily infer from this that science has to do with natural phenomena or facts and with correlating these facts into a system of cause and effect, such systems being known, according to their completeness or universality, as theories or as natural laws. The humanities are concerned with values, and hence include art and literature in their various forms, as means by which values are expressed or interpreted; history, as it is concerned with the development of values and the progression of human affairs; law, which might be included here for its implementation of certain values as they affect the behavioral relation of one human being to another; philosophy, as it is concerned directly with understanding values; and so on. One might designate religion as a principal member of the great humanities family, but I prefer to place it within the category of philosophy because of the direct bearing that the one has upon the other. Finally, with considerable trepidation, I shall define the social sciences as the avenue of human endeavor which is concerned with the syste-

matic analysis of human behavior, both individually and collectively, with the purpose of determining the principles which govern our behavior and by means of which we can predict human behavior in certain sociological situations.

Any attempt to delineate the three areas more sharply would be futile, for the differences are not sufficiently profound. Bridgman has observed that "what is common to the sciences and the humanities is far more fundamental and important than the differences. In the first place, both are human enterprises; this giving them a unity which they cannot escape. Furthermore they are both predominantly intellectual enterprises."[1] To be sure, the humanities and the social sciences are both concerned with values, whereas science is not, at least not in the same sense, and this difference has been belabored to the point where I fear that we, and I include the humanists among us, cease to think of scientists as being human and, in identifying them with their primary intellectual pursuit, conclude that they are not concerned with values. This may appear to be ridiculous, regarding it thus baldly, but I believe it to be true. In fact, I think F. D. Roosevelt was remiss in not proclaiming a Fifth Freedom, namely the freedom to be concerned with values, regardless of primary intellectual avocation.

In this context I agree most heartily with Barzun, who has written that "the man who denies that his subject has principles communicable to any receptive intellect, and who says, 'Hands Off! Unless you belong to my profession . . . you are nothing to me,' is convinced that the world is divided into the few who know nothing about his specialty and the happy few who know everything." I must admit to using this quotation as a sort of boomerang, as is evident when the quotation is continued: "It thus comes about that the majority of workers in the arts and sciences act like jealous technicians with a strong anti-intellectual bias."[2] It would seem appropriate at this point, therefore, to register a plea for a change of perspective. We should resist the temptation to identify human beings with their specialty and grant them their right, as intellectual animals, to live intellectual lives, to taste the puddings and savor the sauces concocted by any and all cooks of the intellect. To be sure, some scientists may appear to be devoid of taste buds and, perhaps worse, some would seem to have taste buds that

[1] P. W. Bridgman, "Quo vadis," *Daedalus* (Winter 1958), p. 85.
[2] Jacques Barzun, *The House of Intellect* (New York, 1959), pp. 12, 13.

have an anomalous innervation, judging by the kinds of sensations they derive from them. But we must all be scientist enough to avoid formulating a generalization from insufficient data.

Norman Foerster was not the first, and certainly he is not the last, to misinterpret the purpose of science with respect to human welfare when he wrote that "the need of standards in life, in art, in criticism is more and more apparent, and naturalism has failed to provide standards. . . . Science gives us natural knowledge, not human objectives."[3] I do not mean to be cruel, but it makes as much sense to complain that beer is deficient in vitamins. I am sure that scientists, as people, could come up with some pretty good objectives, and in so doing don the cap and gown of the humanist, just as the brewers could fortify their beer with vitamins and sell it over the pharmacist's counter. But is this really desirable or necessary? I am sure that Jacques Barzun, Howard Mumford Jones, Parke Davis, and Lederle would say, No.

Newman introduced his recent, provocative article in the *Graduate Journal* with the observation that the split between science and the humanities is never very well defined, that "the two are hardly on talking terms with each other."[4] We recognize this to be sadly true. And it is unnecessary, for they are not in competition with each other, and cannot be, inasmuch as their goals, their methods, and their "raw materials" are so different. In fact, they complement each other, and humanists and scientists have become, with social evolution, completely dependent upon each other, not only for their intellectual lives, but for survival. I do not propose that they link arms and trip together through the fields with daisies pied, or that they even be on talking terms with each other; rather that they recognize each other's importance, show mutual respect, and use freely whatever the other provides. For, as Newman remarks further on, "Science today is perhaps the most secure home of rationality and of faith in rational values; as such it is as valid and valuable as the humanities in defeating mindlessness."

Clearly the humanities offer the scientist beauty and truth, but,

[3]Norman Foerster, *Towards Standards: A Study of the Present Critical Movement in American Letters* (New York, 1930), p. ix.

[4]William J. Newman, "The Humanities, Science, and the Masses," *Boston University Graduate Journal*, VII (1959), 135.

John Keats to the contrary, these are not enough for the intellectual mind. The basis of truth must be known and, if we accept the proposition that truths are relative (except absolute truth, if there be such a thing) we must establish our points of reference with respect to the world around us—that is, if the philosophers will forgive me, with reality in the *real* sense.

The humanist, but especially the artist, may tend to formulate values without regard for reality. Indeed such values have appeal because there is beauty in unreality, and there is considerable satisfaction to be gained by attempting to escape from reality. To attempt to do so is doubtless futile, as Bridgman emphasizes when he proposes the "first law of mental dynamics," namely, "the law that we can not get away from ourselves."[5] Perhaps it is akin to gambling: we know we can't win, but it's a whale of a lot of fun to try!

Here is where science can have and should have its most cogent influence on the humanities, providing the humanist with his points of reference. They are ever-changing points of reference, too, in this age of phenomenal technology, which we all recognize as the offspring of science (and some, unfortunately, even identify with science). Aldous Huxley has made it abundantly clear that modern science and technology have created a reality which is so vastly different from what it was in the last century that all our values, both moral, economic, and sociological, are being forced to adjust commensurately.[6] Science has worked against individual freedom by enslaving mankind to higher standards of living and by providing government with effective means of control over the affairs of individuals. It has done these things by making possible longer life, a more comfortable life, larger populations, all of which demand stronger governmental regulation, and by providing government with the tools of communication, crime detection, and propaganda necessary for such regulation. It is ironical that science has, in effecting freedom from privation and disease, deprived mankind of a large measure of his freedom as an individual. The solution to the dilemma in which we find ourselves is not in sociological retrogression. It lies rather in acquiring more knowledge and deriving from it those values which will guide us best in applying it. In this context Huxley has written this:

[5]Bridgman, p. 91.

[6]Aldous Huxley, *Science, Liberty and Peace* (New York, 1946).

If we abolish science and return to Nature, the population will revert to what it was—and revert, not in a hundred years, but in as many weeks. Famine and pestilence do their work with exemplary celerity. Tolstoy and Gandhi are professed humanitarians: but they advocate a slaughter, compared with which the massacres of Timur and Jinghiz Khan seem almost trivial.

No, back to Nature is not practical politics. The only cure for [the evils which] science [has produced] is more science, not less. We are suffering from the effects of a little science badly applied. The remedy is a lot of science, well applied.[7]

Obviously this does not constitute the complete solution, and I doubt if Huxley means to imply that it does. Bertrand Russell has commented that no civilization worthy of the name can be *merely* scientific:

Science considered as the pursuit of knowledge is something different from scientific technique, and deserves a high place among the ends of life, but among these it is only one of several. At least equal to it are the creation and enjoyment of beauty, the joy of life and human affection. A scientific society which did not promote these things could not be considered positively excellent, even if it were to eliminate much of the pain and misery from which mankind has hitherto suffered.[8]

The breadth and depth of study in the humanities which are required of students in Eastern colleges of liberal arts, irrespective of field of concentration, are laudable. Surely none would disagree that even more would be desirable, were there sufficient time within the four-year academic structure. Fully as important, I think, is more extensive instruction in the sciences than is at present required of all students. If society is going to depend upon the humanities, as it must, for its values and human objectives in our exploding population (and never will the need be greater!) it behooves the humanists to become informed in all of the major areas of knowledge. Clearly the sciences comprise a large segment of that knowledge. View science as an angel or a devil, as you will, but view it you must; for it is here, it is a giant, and to control it we must know it.

[7]Aldous Huxley, "Economists, Scientists, Humanists," *Science in the Changing World* (New York, 1933), p. 211.

[8]Bertrand Russell, "The Scientific Society," *Science in the Changing World* (New York, 1933), pp. 206–207.